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X-ray Polarimetry with Machine Learning: A Hybrid Approach for Tracks Reconstruction in Gas Pixel Detectors

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We present our study on the reconstruction of photo-electron (PE) tracks in Gas Pixel Detectors (GPDs) used for astrophysical X-ray polarimetry. The GPD exploits photo-electric effect to measure the polarization state of incident photons by reconstructing the properties of the track of emitted photo-electrons. The standard state-of-the-art algorithm developed by Imaging X-ray Polarimetry Explorer (IXPE) collaboration consists in an analytic reconstruction of the tracks to determine the polarization properties of the incident photons. Our work is aimed to detect X-ray polarization using a Machine Learning approach, by developing a Convolutional Neural Network (CNN) for reconstructing the PE track parameters. We showed that adopting a hybrid CNN-analytic approach both improves the performance of the standard algorithm and naturally mitigates a subtle effect appearing in polarization measurements of bright sources.

Eligibility for "Best presentation for young researcher" prize

Yes

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